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APPENDIX No. 1.

REPORT ON FORESTRY AND FORESTS OF CANADA, BY H. G. JOLY, MEMBER OF THE DOMINION COUNCIL OF AGRICULTURE.

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This Report refers to the following subjects :—

State of our forests—Causes of the impoverishment of our forests and proposed remedies, —Fire—Fires by Settlers—Fires by Lumbermen—Fires by Hunters—Fires by Fishermen, —Depredation—Waste of timber—Waste from over-production—Waste from making-square timber—Waste from felling undersized trees and destroying growing timber—Waste from manufacture of extract of hemlock bark for tanning—Planting of forest trees—Selection of trees for planting—Sugaries or maple orchards—Study of forestry.

STATE OF OUR FORESTS.

In the division of labour among the Members of the Dominion Council of Agriculture, the subject of Forestry and Forests has fallen to my lot. It is a difficult question and a delicate one, and, from its great importance, it deserved to be entrusted to better hands than mine, but I could not decline when chosen by the Council, and will try and do my duty.

Before entering into the question of Forestry, or the management of our forests, it appears logical to enquire, first, into their present state.

Though we have, in Canada, tracts of forest lands owned by individuals, which would be deemed considerable in Europe, my enquiries will be mainly directed to our public forests, as they yield, by far, the largest proportion of our timber export, and as it will be found difficult enough to deal with them in a satisfactory manner, without complicating the question by attempting to regulate the management of our private forests. One thing at a time.

Our public forests are worked by the lumbermen under a license system, entailing ground rent and stumpage dues.

They contain a great variety of timber, but I will principally call your attention to the pine and spruce, as they form nearly all our export to Europe, and are really the produce of our forest; while the hardwood we export, especially the fine oak, nearly all comes, at present, from the Lake regions of the United States, as we have very little of our own left.

For some time past, the idea has been gaining ground, among men who take an interest in the future of the country, that our great pine and spruce forests are getting rapidly exhausted, and that, before long, a trade which enables us to export annually over twenty millions of dollars worth of timber (nearly twenty-seven millions in 1874, twenty-five millions in 1875, and twenty millions three hundred thousand in 1876), will shrink down to wofully reduced proportions.

Thinking men have begun to sound the note of alarm; we owe it to them, but especially to ourselves, as a nation, to try and find out how far their previsions are likely to prove true.

The enquiry presents considerable difficulties. When, a short time ago, England was startled with the statement that her supply of coal was decreasing with alarming rapidity, she never rested until her mining engineers had measured her coal fields, calculated their probable yield, and showed that there was still in England a supply of coals sufficient to meet a regularly increasing demand, and last for centuries.

But we cannot calculate the yield of the forest of our days with the same facility and accuracy with which mining engineers can calculate the yield of the coal beds, the forests of past days. What is a coal bed but a mass of trees and plants, once growing more or less scattered over vast tracts of the old world, collected, brought together, piled up and compressed into a small volume by the mighty hand of God? How much easier it is to measure off the contents of a forest, condensed into such a small volume, whatever disappointments and errors may arise from faults and disturbances in the coal beds, than to calculate the contents of growing forests, scattered over half a continent from the Atlantic to the Pacific.

Apart from our timber lands, a large portion of our territory consists of fertile prairies, with rare clumps of fine trees; in swamps without valuable timber, and in barren regions of rocky soil, with only a dwarf stunted vegetation. In those parts of Canada where the soil, and other circumstances are known to be generally favourable to the growth of pine and spruce, and where a pretty accurate idea can be formed of the quantity of timber already taken off by the lumberman, who can say without continually renewed investigations, how much is getting swept away every year by our great enemy, the fire fiend?

Let us now try and make an inventory of the timber resources of the Dominion, beginning in the west. On the Pacific shores of the Dominion, in British Columbia, the bountiful gifts of Providence are still stored up for us, and the forests have scarcely been attacked by the lumberman. How long those treasures will last us, and what advantages we shall derive from them, depends, in a great measure, upon ourselves.

Let us now turn eastward, and see if we can learn there, any lesson that will help us to manage our forests of the west.

From the Rocky Mountains to the Province of Ontario there are scattered, here and there, certain tracts of well timbered land, but they are the exception. (*Vide Mr. Fleming's Report of the Pacific Railway, page 313, et seq.*; Professor Macoun's sketch of the country between Lake Superior and the Rocky Mountains.) That timber will be required for the local wants of the people who are now only beginning to settle our fertile prairies, and it will never, I think, contribute to swell the bulk of our timber exports.

The great forest of Canada, *par excellence*, is spread over that vast territory watered by the Ottawa, the St. Maurice, the Saguenay and their tributaries, over one hundred thousand square miles in extent; before drawing your attention more particularly to it, I will mention our remaining timber limits, that cannot compare with it either for size or resources. They are found in the Georgian Bay country; the Muskoka and Nipissing regions; the Eastern Townships of Quebec and south shore of the St. Lawrence, to the Gulf; the region on the north shore of the St. Lawrence, from the Saguenay down to the Bersimis, and, perhaps, still lower down, as far as Mingan; and the country watered by the St. John, the Miramichi, the Restigouche and their tributaries. Those limits, in many places, are scattered and isolated; they have, with few exceptions (such as the Bersimis at the east, and some newly discovered pine tracts at the west, on Lake Superior), been worked for a long time, and cannot be expected to supply, much longer, any considerable quantity of first quality pine, but they still contain an immense quantity of spruce, principally in the east, sufficient for a great many years' supply, if carefully worked and protected. The spruce, unlike the pine, reproduces itself with wonderful ease, and a good spruce country, carefully worked, where you leave untouched all the trees under a certain size, say twelve or thirteen inches at the foot, can be worked and worked again after a very few years' rest, I might say almost for ever.

As a match to the timber wealth of British Columbia in the west, there have been lately discovered at the extreme east of British North America, in the recent explorations through the hitherto unknown interior of Newfoundland, magnificent forests; let us hope that, before long, they will take their place among our Canadian forests.

I will now return to the *Great Canadian Forest*, our great pine country, with its wonderful network of streams, and its three great arteries, the Ottawa, the St. Maurice, and the Saguenay.

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If there is no sign of exhaustion, what is the meaning of the complaints that come over the seas to us, every year louder and louder, about the falling off, in quality and size, of our pine, hitherto considered as the finest in the world? Are they no more than the ordinary complaints of the purchaser? I leave it to our lumbermen to answer.

But, before they answer, I will ask them why are they compelled to go now to such enormous distances for the really superior quality of pine they used to get so much nearer home a few years ago?

Look at the map of that great region, and you will see how little of it is now left untouched. On the Ontario side, all the most accessible tributaries of the Ottawa, the Madawaska, the Bonnechère, the Mississippi, the Petewawa, and others, have been worked for years; the lumbermen are now round the eastern end of Lake Nipissing, with the Matawan for an outlet to the Ottawa, that can only be reached by a land road; they are still much further north, on the shores of the Montreal River.

On the Quebec side, they have nearly reached the head waters of all the great tributaries of the Ottawa, the Rivière Rouge, the Rivière du Lièvre, the Gatineau, with the Jean de Terre and Lake Kakebonga and the Lac des Rapides; they are now working three hundred miles higher up than Ottawa, as the river runs, on Lake Temiscamingue and the Keepawa.

On the St. Maurice, they are as far up as Lake Manooran, on the western side of the river; its great tributaries, on the eastern side, the Bostonnais and the Rivière Croche, have been deprived of the greatest part of their fine pine; it is now sought at the head waters of those rivers.

As for the Saguenay region, it still contains a good deal of spruce, but there is only a limited extent of pine still untouched, or nearly so, south of Lake St. John, between the Metabetchouan and the head waters of the Rivière Croche, near Commissioners Lake and Bouchette's Lake. There is a little pine left north of Lake St. John, and a certain quantity on the River Shipsha, and in the Lower Saguenay on the Ste. Marguerite and Petit St. Jean, &c. As for the large rivers that flow into Lake St. John, the Chamouchoua, Mistassine and Peribonca, the pine that was on the lower part of those rivers has been nearly all cut, and the remainder of their course from their distant northern sources, is through an immense burnt up wilderness, where the vegetable soil has been consumed by fire.

That huge tract of lumber country, between the Ottawa and the St. Maurice, that separated (or rather appeared to separate) the lumbermen working on those two rivers, by what seemed an inexhaustible and endless forest,—that huge tract is tapped through and through, and the Ottawa lumberman has met the St. Maurice lumberman on the shores of Lake Manooran. A glance at the map will show what that means.

Those who think that there will never be an end to our timber may say: "We can still go north."

Not very far north. From Lake Temiscamingue and the Montreal River, on the shores of which the lumberman is plying his axe at this very moment, they cannot go very far north, before they strike the height of lands, dividing the St. Lawrence water-shed from the Hudson's Bay, and the country is generally poor and barren. There is still some fine pine there, in what quantity is not known, along the head waters of the Ottawa, but it cannot be brought down to market, at least as square timber, until very extensive and costly works have been executed for the improvement of the great Rapide des Quinze.

Once over the heights that divide the St. Lawrence and Hudson's Bay water-sheds one from another, the streams, without which timber cannot be brought to market, all run to the north, to James' Bay and Hudson's Bay. Those regions are generally represented as a huge barren wilderness with little timber and that mostly of a stunted growth. There is, doubtless, some good timber, but the idea of driving it down the Rupert, the Notway, the Harricanaw and all those long rivers, to the shores of James Bay, and taking it home down Hudson's Bay, eight hundred miles long and through

the dangerous Hudson's Strait, does not appear very practicable. Whatever timber there may as well be considered as out of our reach for the present; in the course of time the scarcity of timber fit for export may become so great as to encourage the lumbermen to turn their efforts in that direction, but that region may safely be left out of our reckoning or the present available timber supply.

In a very short time, since the beginning of this century, we have overrun our forests, picking out the finest pine, and we have impoverished them to a serious extent, and what makes it worse, impoverished the country too, for, owing to the force of circumstances which we shall consider later, our timber export trade has not given Canada such a return as she had a right to expect. There still remains to us a great deal of spruce and second rate pine, which for generations to come will be in excess of our local wants, if we are careful; but the *really fine pine*, required to keep up our great timber export trade to its present standard, is getting very scarce and inaccessible, and I fear that we must prepare for a sudden and considerable falling off.

While every one admits the great value of the timber trade to Canada, no one would complain in a new and scarcely peopled country like ours, if the finest pine forests were to disappear and make room for fine farms. But, unfortunately, we cannot comfort ourselves with such hope; the soil of the pine region is not generally favourable to agriculture, and when the pine disappears, the farmer does not often take its place.

Men are the same all over the world; they never set much value upon the free gifts of Providence, and disregard them in proportion to their abundance—timber, fish and game have been destroyed everywhere in the same way. When what appeared to be inexhaustible becomes exhausted, it then begins to be valuable; we must pay for our experience.

Our neighbours, in the United States, have applied to the destruction of their forests their superhuman activity and energy, and they are now worse off than we are for timber. But their eyes are being opened; the President, in his last message, has earnestly drawn the attention of Congress to the subject, and the following quotation from the last Annual Report of the Secretary of the Interior, shows how thoroughly they appreciate the gravity of the situation:—

"The rapidity with which this country is stripped of its forests must alarm every thinking man. It has been estimated by good authority, that if we go on at the present rate, the supply of timber in the United States will, in less than twenty years, fall considerably short of our home necessities.

"It is the highest time that we should turn our earnest attention to this subject, which so seriously concerns our national prosperity."

I do not fear so much on the score of deficient supply for our home necessities, but it is our great export trade that is in jeopardy. We have still got an enormous quantity of common timber on the Crown Lands, and our people, beginning to appreciate the value of the wood that grows on their own farms, have generally ceased to look upon it as an incumbrance, to be got rid of at any cost. But it was not always so, nor is it so everywhere even now. As far back as the year 1696, the attention of the French Governors of Canada was drawn to the wasteful destruction of the forests, and they were called upon to check it. Nothing, however, was done by them, and little has been done since. The result stares us reproachfully in the face, especially in the Province of Quebec, the oldest in the Dominion. The old settlements are painfully bare of trees; you can sometimes go miles without seeing any tree worth looking at, and the passing stranger fancies himself in a country more denuded of trees than the oldest parts of Europe. There is a large district of very good agricultural land, south of Montreal, where the scarcity of firewood, which is a matter of life and death in our climate, has compelled many a farmer to sacrifice a fine farm and leave the country; there are many other spots in the Province nearly as bad, and unfortunately the process of destruction is going on even now in more places than one.

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must conclude by saying that it is very far from satisfactory, and leaves much room for improvement.

What are the main causes of that unsatisfactory state, and is there any remedy?

CAUSES OF THE IMPOVERISHMENT OF OUR FORESTS, AND PROPOSED REMEDY.

The great causes of the impoverishment of our forests are fire, depredation and waste. I will begin by fire.

Fire.

We can cope with waste and pillage in our forests, they are but the work of man, but we are terribly helpless against fire. It is, in every country, the greatest enemy of the forest, especially the pine forest, on account of its resinous and inflammable nature. It is ubiquitous, you find it exercising its ravages wherever nature has planted its grand virgin forests; in North America destroying the beautiful white pine, and at the Antipodes, in New Zealand, sweeping away the noble Kawrie pine; through India, the Russian Empire, Sweden and Norway, it throws around the globe a girdle of lurid flames, only broken by the great oceans.

It is estimated by those who are most competent to form an opinion on the subject, that *more pine timber has been destroyed by fire than has been cut down and taken out by the lumberman*; not only is the large ripe timber destroyed by fire, but all the young trees too, upon whose growth we must depend for the re-stocking of our forests. It is not practicable, in our Canadian woods, to plant trees to take the place of those that are cut down.

The difficulty of guarding against fire in such immense and distant forests as ours is enormous, and as for extinguishing it when once fairly started, *the power of man cannot do that*. It will sweep onward as long as it can find food, leaping at one bound like a giant over such rivers as the great Ottawa and Miramichi, and will only stop when brought to bay by large lakes, or when it reaches rocky or barren ground with nothing to burn; it will riot for weeks, until starved for want of food, or drowned under torrents of long expected rain.

In France and Germany, where the science of forestry is brought to a high state of perfection, where the forests are much smaller than ours, divided and isolated one from another, kept as much as possible free from rubbish and dead timber and all the light stuff that carries on the flames so rapidly, protected by stringent laws, strictly enforced for generations; watched over by large staffs of foresters; even there disastrous fires are of frequent occurrence, and they call for such an effort to suppress them, as is totally beyond our power, as the following example will show.—

Considerable pine forests have been created within the last two or three generations in the south-west of France, and now cover large regions that were once barren heaps of sand rolled up far inland by the action of the sea. Those forests, created by man now yielding a large and ever-increasing revenue, are highly valued and must be protected, one would think, as well as any forest can ever hope to be protected. Nevertheless, fires are frequent among them.

The people do there what we cannot do here and generally conquer the fires, with more or less loss. But a short description of their mode of warfare will show how utterly inapplicable it is to our circumstances, and make us feel, more than ever, that *our only hope is in PREVENTION*.

In France, as soon as it is discovered that the forest is on fire, (which cannot take long, where the forests are comparatively small, and the country *thickly settled* all round,) the church bells ring in all the neighboring villages. The whole population, trained by long practice, turns out, with axes, spades, shovels, rakes, &c., under the guidance of acknowledged leaders. They combine their movements according to the direction of the wind and other circumstances, and dispose their forces with intelligence and promptitude. A mode often resorted to, is the *contre feu*, fighting the fire with fire, something not unlike what the hunters practise when overtaken by

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fires in our western prairies. Knowing the forest well, they direct their forces to one of the *coupe-feus* or *safety strips* (upon which no trees or shrubs are allowed to grow) or to the most favorable spot on the path of the fire, at a sufficient distance ahead of it, form an extended line of workers wider than the fire, and set to work to remove as much of the inflammable materials, as possible; they cut down and burn, and trample, and shovel earth, and carry away stuff, &c., and when the fire, in its course, reaches that spot, it finds little food, hesitates, lingers, and at last, is generally conquered.

We cannot do that. Our forests are not surrounded by villages, the alarm bells cannot muster crowds of willing workers to our distant wilderness, often hundreds of miles away from man's dwellings.

But, if we cannot stop the fire, can we not do something to prevent it, and to limit its ravages? The best means adopted in Germany and France, and in Great Britain too, (where the science of forestry is becoming an object of serious study) for preventing the spreading of the fire over a large extent of the ground, is the laying out of their forests, and dividing them into isolated independent blocks, by means of the *safety strips* or *coupe-feus*. But even there, whenever the wind is very strong, it has been found that it would often carry inflammable matters, such as pine cones, clear over everything, to a distance of one and even two miles and start fresh fires, where they fall, which will be readily believed by those who remember how easily fires have swept over the Ottawa River.

Though not always sufficient, those safety strips are, nevertheless, of great service, but their opening is scarcely practicable with us. It would entail incredible cost and expenditure, on account of the great length we would have to prolong them, and the distance, and because, furthermore, the brush and timber felled down to make them, would have to be removed, otherwise it would soon dry up and increase the danger, instead of decreasing it. Then, to maintain their efficiency, they would have to be kept clear of a new growth. We cannot think of undertaking such a gigantic work, at least in our large and remote forests. Neither can we undertake, as they do in Europe, to clear the underbrush and to remove the dead wood and rubbish; it is an excellent precaution, and its adoption in Europe is not only free from cost, but even brings a large profit. Our circumstances are totally different, as every man any experience must know, and I will not enlarge upon that point.

If we cannot profit by those good examples, we are nevertheless, not going to sit down tamely, and declare that nothing can be done. *We can do a great deal to prevent our forests being set on fire.*

These fires are started by settlers clearing their lands; by lumbermen whilst driving their timber down the stream; by hunters and fishermen: by sparks from locomotives; by lightning; sometimes, even by the violent rubbing of dead branches one against another in gales of wind.

We cannot very easily provide against the latter cause, as we cannot remove all our dead wood, and we cannot provide against lightning in the forest. But locomotives can keep down their sparks, with screens over their smoke-stacks. The railway companies are interested in every way in guarding against fires, and if they neglect to take sufficient precaution, they can be reached and called to account.

Fires by Settlers.

A frequent cause of disastrous fires in the woods is the mode of clearing land now generally followed by settlers. Of course, they must have recourse to fires in order to clear wood lands, but *fire ought to be our servant, kept under continued control, not our master.*

Wood land can be cleared with comparatively little danger from fire, and be made ready to sow earlier than by the mode now generally in use (as I know from practical experience), if the settlers will only burn the shrubs, branches, leaves and tops at once, as they cut them down. Light a good bright fire to start with, after having made a *safe place* for it, and then begin cutting away, and as you cut throw

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direct their forces to the fire at once; children will help immensely with the light stuff, and willingly rubs are allowed to go. The fire once well started, everything will burn up, the green wood with the sap running out, and the green leaves too, not only those of fir-trees, but of every hard-wood tree. As you throw in the branches the whole of the green leaves upon them catch fire simultaneously with a sudden flash, and burn up with a crackling sound as if they had been steeped in grease.

I have often done it, frequently in wet weather. We get rid immediately of all the light inflammable material, from which the greatest danger of bush-fires is to be apprehended; the larger branches and trunks of trees, if you must burn them (which you ought not) present little danger of fire in dealing with them. When you get inconveniently distant from your first fire, you light a second one and let your first one burn out; it is remarkable that those fires generally burn down to the ground more thoroughly than the carefully constructed piles that have been drying up for a whole year.

Increased safety from fires is not the only advantage that would accrue to the settlers from the adoption of this mode of clearing wood lands. Take them as a whole, for the sake of comparing them, and this mode does not give more work than that now in use. True, you have got to convey the stuff you intend burning a little further, because one single fire, continued and replenished for some hours, will dispose of as much stuff as would have made one or two dozen average piles, but then, think of the advantage of having got all that rubbish out of the way at once, instead of having it to cumber the ground until next year, when perhaps the season will be too rainy for burning, or so dry that you will run the risk of setting fire to your own farm and the whole surrounding country. As the work is now done, even in a small clearing, no settler can keep all his fires under absolute control; he is obliged to wait for dry weather and then he has got twenty, thirty and more fires going on at once. A sudden gust of wind, which is often produced by the intensity of the fire itself in the stillest weather, and off the fire goes, reaches the woods close by, and meets there with such encouragement as to get very soon beyond human control.

As a further precaution against the danger to the forest arising from the clearing of lands by fire, I would recommend that the Government should confine the settlements, as much as possible to the hardwood lands, of which there are large tracts still available. "As a general rule (to quote the words of Mr. Allan Gilmour in answer to questions of a Committee of the House of Assembly of Quebec) it is well known that they are of much better quality for farming purposes, than those covered to any great extent with pine, while they are at the same time much more easily cleared, and will give, as a first crop, a good return, in the shape of pot or pearl ashes from the burnt timber, should the parties clearing the land choose to make them—a benefit which cannot be had from pine burnt in the process of clearing.

"In settling the hard wood lands, there is also the important fact to be considered, that fires do not spread through them to anything like the same extent as where pine chiefly prevails; and, indeed, from a very extensive observation, I am of opinion that fires have little disposition to spread in the former, while the reverse is the case with the latter."

To show how generally it is acknowledged, among practical men, that hardwood forests enjoy a greater immunity from fire, than pine and other coniferous forests, I will select one striking case, out of many. In Hanover, (where the science of forestry approaches nearer to perfection than in any other part of Germany) where railways pass through fir forests, and it is feared that the sparks flying from the locomotives may light the accumulated fir leaves, dry heather and other smaller plants, it is customary to guard against this danger by means of safety strips, formed by other kinds of trees, not coniferous, that are planted along the line of railway, as for instance birch, coppice woods of oak, &c.

Before concluding this part of the question, viz., bush fires lighted by settlers, in clearing the lands, I would recommend:

1st. Such a study of the soil of our unsettled lands, as would enable them to be

classified under two distinct heads,—lands fit for agriculture, to which the settlers ought to be sent, and lands unfit for agriculture, from which the settlers ought to be kept away, for their own sake as well as for the public good.

2nd. Legislation, for the purpose of increasing the powers of Municipal Councils, and enabling them to compel the adoption of every precaution which they may deem necessary, to reduce the danger of bush fires in clearing of land, and to impose severe penalties in case of neglect. To that increase of power ought to be added an increase of responsibility for neglect of duty, which would make the municipal authorities more watchful, and prepare the people for a more strict enforcement of regulations.

3rd. In new settlements not yet ripe for the municipal system, the Government regulations would have to be enforced by wood rangers; as the season for burning is not a long one, and is often shortened by rains, the period during which the Government officials would have to exercise their vigilance, in relation to this matter, is not a long one.

The Province of Quebec is in advance, not only of all the other Provinces of the Dominion, but of the United States too (see last Report of the Secretary of the Interior) in passing a law for the protection of the *public forests* against fire, (34 Vic. 1870, Cap. 19.) It contains some very good provisions which would be of great benefit were they carried into effect; which would entail greater sacrifices than the province has been, hitherto, willing to make, though not greater than the magnitude of the interests at stake require.

Fires by Lumbermen, Hunters, and Fishermen.

The origin of many fires has been traced to them, but, in no case have I heard of any evil intent, on their part, to do harm; it is through thoughtlessness, and they must be educated to prudence.

Nothing is so striking as the contrast between an European, the first time he sets foot in our forests, and a Canadian, familiar with the woods; the feeling, amounting to actual veneration, with which the European will look at our boundless forest, the melancholy glance at the fallen tree, the sigh over the dead timber, rotting where it fell, the fierce denunciation of the great waste, and especially the reluctance at leaving behind him the smallest fire, before it is thoroughly extinguished; on the other side, the naturally complete indifference of the Canadian, not only to the scenes with which he is familiar, but especially to the danger of fire.

However difficult, or next to impossible, it would be to prevent the work of the incendiary, it is not impossible to force prudence upon the careless, and to open the eyes of the inexperienced. It will entail a much larger expenditure than is now incurred, as the number of forest rangers must, of necessity, be considerably increased; but if it is true that so much timber is destroyed by fire (and no one will deny that the losses are enormous, however difficult it may be to compute the amount), is it not worth while protecting our forests from that danger, by devoting to such purpose a reasonable share of the large sums they yield every year to the Public Exchequer?

Lumbermen.—They cannot set fire to the forests in winter, while carrying on all the operations necessary for the cutting, squaring, and hauling of the timber; the danger only exists when they drive it down streams, in the spring and often in their wet clothes and warm themselves, to enliven their few minutes of rest, or, when the season gets more advanced, to smoke away the flies. Before the fire is fairly blazing, a shout is heard, and as the canoe, or the crib or the loose logs dart past, our friends take a flying leap upon them, and down they go with the swift current, leaving the fire to itself.

It ought to be impressed upon the foremen, as one of their most important duties, that they must look after their men carefully in the matter of fires. As the lumbermen themselves have recommended, in their conventions, careful men ought to be selected in each drive, to see that the fires are lighted and put out with every precau-

which the settlers ought to be kept; or a Government woodranger might be detailed for each drive or group of drives, when close enough for that purpose; or, should that entail too much expense, each woodranger might watch over a certain length of the river. The fires are only lighted on the banks of the streams, during a drive, not inland; how easy it would be to throw the burning sticks or roll the burning logs in the water, with so many men on hand round a camp fire.

A moment's reflection ought to convince all those who *make their living by the forest* that it is their interest to let *the forest live*. When the origin of a bush fire can be traced *distinctly* to the men employed on a certain drive of timber (which might often be accomplished, with a good system of supervision), I cannot help thinking it is only fair that their employer should be made to feel his responsibility, and be deprived of his timber limits and license if he cannot make good his damage. A few examples of just severity would produce the best results.

Hunters.—Men who live by hunting, Indians and white men, do not often set fire to the forest; it is their home; neither is much to be feared from amateur hunters who conform to the *Game Laws*. All over the Dominion, the season for shooting such game as is found in the forest, opens generally, about the beginning of September, when the driest season is over and the autumn rains begin. This is a point upon which much stress is laid in the Forestry regulations of Europe, and perhaps our game laws might be slightly modified to insure greater safety here.

But those who shoot in the woods, out of season, ought to be doubly punished, as they ruin the game and may be the cause of ruin to the forests.

Fishermen are more dangerous than hunters. It is not their fault, and I do mean to cast any aspersion on their character; for when we see them exercise, in the pursuit of their avocation, so much patience and coolness, we are bound to credit them with the sister qualities of caution and prudence; it is the season during which fishing is allowed (and during which only it can be allowed) the driest part of the summer, that makes it so dangerous.

In granting leases for the right of fishing rivers, it would be advisable for the Government to increase the stringency of their regulations, so as to cause the lessees to be very careful how they themselves, their friends and those under them, light and put out their fires.

The precautions indicated in the Quebec Act already alluded to, 34 Vict., cap. 19, especially those in Section 4, for lighting and putting out of fires, in the woods, are very practical and effective, and ought to be adopted and enforced everywhere. They order a careful selection of the locality, where there is the smallest quantity of vegetable matter, dead wood, branches, brush wood, dry leaves or resinous trees; the clearing away of those inflammable materials, within a radius of four feet from the fire to be made, and the total extinguishing of the fire before quitting the place. Any honest, conscientious man, with a head on his shoulders, ought to take those precautions, and be as careful of the property of others as he would be of his own. There are times, in the long droughts of summer, when a man is just as guilty, who throws down a lighted match in the woods, *as if he threw it in a barn full of hay*.

The enforcement of regulations made for diminishing the danger of fire, during the fishing season, would not entail such expenditure as might be expected. The woodrangers and fishery inspectors would not have to watch over every square acre of forest, an army could not do that. An officer, well up to his work, would soon become acquainted with every good fishing pool where fishermen are likely to go, and would keep an eye on those spots; in his rounds, he might watch, warn and arrest careless people, if necessary.

The forest rangers, fishery inspectors and all officers connected with the protection of the forest and its contents, ought to be provided with a number of printed circulars, posters, &c., warning the people in the strongest terms, and to distribute them liberally, posting them up wherever there is a chance of their being seen; the sight of them would act as a reminder with those who could not read them.

I will not apologise for entering into all these details; we cannot achieve any great results if we overlook them.

In conclusion, fire is the only real danger to be dreaded for our forests. Waste and pillage can be put down, however far they may have gone, *and there is a cure for them.* For fire there is no cure, nothing but PREVENTION.

DEPREDACTIONS OF THE PUBLIC FORESTS.

I will dispose of this question very briefly. The man who goes on the Crown Lands and cuts timber where he knows he has no right to cut it, and carries it away, is a robber, and ought to be treated as such.

Nothing is easier than to discover depredations, on anything like a large scale, in the public forests of Canada, and to trace out the guilty parties.

The timber can only be removed in winter on the snow roads, and as it must be floated down the streams in the spring, it must of necessity be piled up on the banks of those streams; the woodranger can follow it everywhere, as long as it has not been hauled out to the settlements, which is impossible in our distant forests. The mark of the snow road over which timber has been drawn through the woods, will remain for the whole winter, whatever amount of fresh snow may fall, the trees along the road with their bruised, broken bark, and lower branches chopped off will be witnesses too against the depredator, and their silent evidence is certain to lead to his discovery.

Once discovered, how is the depredator to be dealt with?

I thoroughly sympathize with the views of the Secretary of the Interior of the United States, the Hon. T. Schurz, and will quote a few lines from his last Report, pages 17 and 18: "I desire to make those who hitherto have carried on those depredations with profit, understand that, in the attempting to steal timber from the public lands they will, in any event, lose the value of their labour and their expenses and expose themselves to criminal prosecution."

"With regard to the criminal prosecution of depredators, I would recommend that they be not confined to those mostly poor persons who actually cut timber on public lands with their own hands, but that they be directed as well and principally against the parties who are found to have organized and directed the stealing of timber on the public lands on a large scale, and derived from that criminal practice the greatest profit."

The Report next alludes to the number of prosecutions lately instituted, and answers to complaints of injury done to business by a strict adherence to that policy as follows: "As to the injury done to business, if that business consists in wrongfully taking timber from the public lands of the United States and manufacturing it into lumber and selling it, it is just the business which it is the duty of this Department to suppress for the protection of public interest."

The only difficulty attending this question, is for a Government to make up its mind to stop depredation on its forests; its mind once made up, it is strong enough to protect its own property. With right and might on its side, the result cannot be doubtful, nor is the duty of the Government doubtful, either, when it is called upon to defend public property.

WASTE OF TIMBER IN THE PUBLIC FORESTS.

There is waste of timber in our public forests from over-production, making square timber, cutting down undersized trees, manufacturing of hemlock bark for tanning, &c., &c.

Over-Production.

There cannot be a greater waste of any marketable commodity than over-production. It is unavoidable, as the extraordinary success of a given branch of industry is certain to produce it, but, generally, it does not take long after its fatal

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effects are felt, before the evil cures itself. Unfortunately, our timber trade is an exception to that rule; in the face of a glutted market we persist in our over-production, as if we expected to relieve the market by glutting it more and more.

Over-production, in the timber trade, is a greater evil than in any other business, as the raw material cannot be replaced for generations.

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How ought it to be dealt with? People who dwell on abstract theories, and trust in the providential interference of the great law of demand and supply, as the only source from which relief may flow, say: "What is the use of Canada attempting to decrease her production of timber, it will make no difference in the prices, as other countries will rush in, and make up for the deficiency in our produce? They will benefit by our abstention, we won't."

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First, it will be of use in preserving our forests. Secondly, the other nations that might come in, to make up for our deficiency, Sweden and Norway and Russia (I don't speak of Germany, as its excellent system of forestry places it in a much more favorable position) are destroying their forests just as fast as we are, and, as they began long before us, they are more advanced than we are in their work of destruction. They are producing as much as they can produce; to keep up the supply in Sweden and Norway they are now cutting their spruce trees when they have attained six or seven inches diameter, killing the goose with the golden eggs; we are not reduced to that yet. Even in the matter of spruce, they cannot ship deals as large as ours; as for pine, where is the white pine (or yellow pine as it is called in England) with which they could replace ours?

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Those who offer such arguments against the reduction of our production of timber are the same who relying on the law of demand and supply as a panacea for all evils, say: "Let it alone, it will adjust itself sooner or later." It will be later, I fear, in this case.

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The lumbermen are more practical; they know the only remedy is to decrease the production; they acknowledge it in their Conventions; they try, earnestly, no doubt, to apply the remedy, with what result is known to every one. With a few exceptions, the lumbermen of Canada, as a rule, cannot stop their production of timber; they can scarcely curtail it. Without meaning any disrespect to a class of hardworking, honourable men, I think they may be considered (with the few exceptions above alluded to), as not being *free agents*.

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At every step they must feel their dependence on the will and caprice of others, from the obtaining of timber berths to work upon, the hiring of men, the supplying of provisions, the sending men, stores and horses hundreds of miles away, into the wilderness, down to the cutting, squaring, hauling, driving, booming, rafting, culling, loading and shipping; and this is why I use the unpalatable expression that they cannot be considered as free agents.

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Their relations with the advancers of money, the banks, the brokers, the purchasers in England, are of such a complicated nature, that it is difficult for them to realize, at any time, what their financial position is; they know they are dependent upon others, they have been so from the beginning, and they continue so, until at last, after long years of harrassing, desperate work, with both body and mind worn out, they find themselves poorer than when they began.

If this is not an overdrawn picture, if there is any truth in it, it will naturally be asked: "Why are there so many men who still cling to the lumber trade?"

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They cannot help themselves; if they could shake off all connexion with the trade, what would they do next? How gladly many of them would take any other occupation, if they could get it. See how many of the Ottawa lumbermen are now turning their eyes to the great phosphate deposits recently discovered on the Ottawa; they see there a new opening for their energies, and let us hope that many more such openings will present themselves before long. Our mineral wealth is great, and we might find in our mines during the long winter months, an outlet for the activity of

our agricultural population, which is now spent, to so little purpose, in the manufacture of timber for an over-stocked market.

The lumbermen have indicated the remedy for over-production, but have not been able to apply it. They can only apply it successfully with the help of the Provincial Governments. I respectfully maintain that it is the right and the duty of those Governments to interfere; the right, because the timber belongs to the Province—the duty, because they are answerable for every stick of that timber.

Each lumberman is ready to admit that he (or rather his neighbour) is cutting too much timber, and that he would make more profit with a lesser quantity. It is bad enough that so much money should be wasted away in cutting down timber for no good; but, if there was an inexhaustible supply of timber on the Crown Lands, the Government receiving a larger amount of timber dues than it might otherwise, would not be likely to interfere, to protect the lumberman against himself.

But our forests are getting rapidly exhausted, and their produce sacrificed; it is a loss for Canada and for the lumbermen. It is full time for the Governments to interfere. Will they do it and can they do it, in justice?

Of course, the first result of a decrease in the production of timber, in so far as the Government was concerned, would be a corresponding decrease in the Crown Lands receipts. I won't call it the revenue, because there is something deceptive in the use of that word, we are apt to fancy that it always means, (as Worcester has it) "the income or annual profit received from lands or other property." It is nothing of the kind in this case. We have not been spending the income or annual profit of our forests, but the forests themselves,—not the interest, but the capital.

It will be said that, without the large sums of money derived from the cutting of timber on our Crown Lands, the building of railways could not have been encouraged as it has been. Nothing can contribute to the prosperity of a new country more than a railway carefully located so as to satisfy some great public necessity, without calling for sacrifices beyond the forces of the country; but, while looking forward to the benefit to be derived from it, the cost must not be forgotten. We have been sacrificing our forests for the sake of our railways.

So far as mere power is concerned, it seldom happens that a Government can control any trade, as completely as our Provincial Governments can control the timber trade, without laying itself open to the charge of undue interference with business. In this case, the Governments themselves are parties to the trade, since they are the owners, and the sellers of the standing timber.

I do not advocate any infringement of vested rights, nor interference with existing arrangements, but a just and fair exercise of the control the Government possess over their own property, whenever the occasion arises to exercise that control. If I am not mistaken, that occasion presents itself every year to the Provincial Governments. The Government of Quebec, however, is in an exceptional position; for a wise purpose, that of making timber-limit holders more careful of their limits, it bound itself several years ago, to renew the timber limit licenses until April 1889; but it reserved to itself the right of changing the tariff of dues for cutting timber once, during that period, on the 1st of September, 1878, next autumn.

I have been requested by the Federal Council of Agriculture, "to suggest such measures as may be required to secure the systematic management of the timber regions of the Dominion, so as to balance the yearly cutting with their annual growth."

My duty is clearly to try and suggest such measures, even if it does not rest with the Federal Government to consider and adopt them. I cannot help it, if matters are complicated by the fact that, in no two Provinces of the Dominion, can the question be considered from exactly the same point of view and dealt with as if it were an isolated question, to be taken on its own merits, owing to the difference in the financial status of the different Provinces.

But if we wish to save our forests, the necessity for the prompt application of some effectual remedy is the same in every Province; the quantity of timber cut

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every year must be considerably reduced, if we wish to balance the yearly cutting of our forests with their annual growth. The revenue of our Crown Lands must shrink of course, but it will become a *bond fide* revenue upon which we can permanently rely.

To sum up, the Provincial Governments can do a great deal towards checking the over-production of timber, improving thereby the tone of the timber market and preserving our forests.

Opinions will be divided as to the best and fairest mode of action, and as to the right of the Governments to interfere. If they can alter the amount of timber dues, they can interfere most effectively, and without exceeding the limits of their power, and compel, if need be, the lumbermen to submit to such just restrictions as will preserve our forests from destruction.

I would recommend limiting the lumberman to a maximum cut of so many thousand feet per square mile of his limits. Let it be understood, I do not mean that he should have to cut so much on each and every individual square mile, but that, out of his whole limit he should not take more than at the rate of so many feet per square mile. Of course, any plan that may be adopted will require very careful consideration and adjustment.

In relation to the checking of the over-production of timber, it will be found interesting to study the plan proposed to the Pennsylvania coal producers for limiting the production of coal to certain proportions. (*Vide Engineering and Mining Journal* of New York, of the 15th December, inst.) Though the two cases are not identical, nevertheless we can derive some useful hints from what is proposed there.

I will not presume to say more on the subject, feeling confident that the Provincial Governments duly appreciate the importance of this question, and trusting they will find means for protecting the public interest, while they at the same time relieve the timber trade.

Square Timber.

In making square pine, the waste of timber is generally estimated at one-fourth of the whole, and the best part of the tree, too, that part which in saw logs gives the splendid broad deals, for which Canada is famous. As it is not every tree that is sound enough for square timber, many a pine is cut down and left to rot. There may be something wrong about the heart or in the length, that would not have prevented it from being turned into saw logs, but won't do for square timber, and so it is condemned.

Chips made in squaring trees considerably increase the danger of fire. In summer they get very dry and inflammable, and the way in which they are disposed in straight lines, thirty, forty, and fifty feet long, like trains of gunpowder, appears well calculated for spreading the flames through the dead pine leaves, dry branches and moss.

But, perhaps, they cannot do without those huge beams of timber in England? In most cases, the first thing they do, when they get them there, is to cut them up. Those splendid beams, fit for giant's works, upon which we Canadians are wont to gaze with so much pride, and which have caused us to waste (in order to maintain their noble proportions) so much valuable timber in squaring them, so much trouble in hauling, handling, stowing on board ship, are cut up, past recognition, as soon as they land.

It is quite right for the buyer to cut them up, if he likes, in order to produce the smaller sized lumber he requires. But why don't we send him that smaller sized lumber instead of huge sticks? It would give employment to our people, and save the good timber that is now wasted, in squaring.

I think it would come cheaper to the consumer in England. Square timber is not invariably sound all through; when cut up, unexpected flaws and rots are often discovered, that were invisible from the outside. Those flaws would have been discovered, if the timber had been sawn up here, and the defective parts would not have been sent across.

The difficulty is in reaching the consumer in England, but the distance is not the greatest obstacle. Between the consumers and the Canadian lumberman stand a few

men, the importers of square timber. It is their steam mills that cut up our big square sticks into bits; their interest is directly opposed to our sending timber reduced by us to such dimensions as would suit the consumers, and they oppose strenuously the introduction of our two-inch deals, inch planks, narrow deals, etc. No one can blame them for standing between the Canadian producer and the British consumer, and for making money out of both.

But could we not get nearer to the consumer in England; could we not find out what qualities and dimensions of timber are most generally in request, send them over to England, and keep assortments of them within easy reach of the consumers?

Why should we condemn ourselves to part with our timber in its rough state as we may consider square sticks, or three and two inch deals, leaving to others all the profit of working it? Why can we not send timber of every size, and width, and length required, from railway timber, beams for houses, narrow strips of spruce for flooring, ready to lay down, door frames, window sashes? It would give us a large increase of work and help us to dispose, with profit, of a quantity of pieces of timber, sidings, cuttings, ends, slabs, that are now lost. For several years past, some of our most enterprising manufacturers have been sending some cargoes of worked timber to South America, Australia, etc., but we still send the great bulk of our production, unmanufactured, to England. Last summer a Quebec firm has sent pine boards, one inch thick, to Great Britain; I hope the result will encourage them to continue and increase those shipments, as they are rendering a real service to the country.

Look at Norway and Sweden, which send more lumber to England than the whole of British North America. Where would their lumbermen be, if they limited themselves to the shipping of large sticks of square timber, and did not export any sawn spruce smaller than three inch by seven, or two by nine, as we do? There, a spruce log, nine inches in diameter, is considered as a large log, above the average. Here, such a log would be too small to pass through our saw mills, with the saws set for cutting spruce for the English market, such as we allow ourselves to be limited to.

As Mr. Wm. Stevenson says, in one of his interesting chapters on timber, in the *Timber Trade Journal* of 3rd March last: "One of the most characteristic features of the wood trade of Norway is the small size of the trees; a traveller may journey for miles along the banks of such important water ways as the Glommen, and be unable to distinguish anything larger than pit props or telegraph poles." The Norwegians manage to turn their small spruce to good account, and send it to England in narrow strips, planed, tongued and grooved, ready for flooring, and in all sorts of manufactured forms.

I totally disapprove of their cutting down their small trees, instead of letting them grow, and do not point to their example, on that head, as one to be followed, quite the reverse. But I strongly approve of their keeping as much work as they can, at home, and of using every part of a tree, when once it is down, and hope the time is not far distant when we shall do the same. Of course, we shall make very little square timber when that time comes.

The square timber makers will say: "We know what we are about; it pays us to make square timber, otherwise, we would not make it."

I dare say it may pay them. But does it pay the country at large? What becomes of that fourth part of every tree that is lost, in the squaring? Does the lumberman pay for it? Does he pay for all the trees that he fells and leaves to rot, on account of some defect which, in most cases, would not have unfitted them for making saw logs?

I trust the Provincial Governments will find it advisable to remodel the tariff of timber dues and charge such a price per cubic foot, for square timber, as will, if not completely stop its production, at least check it considerably. If they cannot do without our square timber abroad, they will have to pay a higher price for it.

There is another way of meeting the difficulty, if the Provincial Governments cannot agree on some joint action. There is now, and there has been, for years past, an export duty on shingle bolts, stave bolts, oak logs, spruce logs and pine logs; let the Federal Parliament put an export duty on square timber.

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FELLING UNDERSIZED TREES AND DESTROYING GROWING TIMBER.

After comparing the regulations of the Provinces of Ontario, Quebec and New Brunswick, and the Dominion Law for the Public Lands of the Dominion, Quebec is the only Province in which I find a limitation as to the minimum size of timber allowable to be cut, on the timber limits: "It shall be no longer permitted to cut, on "Crown Lands, pine trees measuring less than twelve inches, in diameter, at the "stamp."

This wise regulation ought to be extended to the spruce, where its application would be infinitely more frequent, and to every other timber, with such modifications as would best suit the different kinds of trees. Our spruce forests are full of young spruce of every age and dimension, sufficient to keep up an everlasting supply, if intelligently worked; but, strange to say, you scarcely find any young pines in our best pine forests; ask those who have seen most of our pine groves, and they will tell you how scarce the fine promising young pines are.

Why does not the pine sow itself and reproduce itself with the same facility as our other native trees, especially the spruce? It drops its seeds in the same way. Is our growth of the giant pine enough to exhaust the soil? However, I must not indulge in useless speculations; the scarcer our young pines are, the more anxiously must we watch over them, and I think that twelve inches diameter appears much too small for pine. From that size they increase so much in value with every extra inch of diameter that I would suggest sixteen or eighteen inches as the minimum, instead of twelve.

In the Dominion Act of 35 Victoria, Chap. 23 (An Act respecting the Public Lands of the Dominion) the provisions of which are now in force in Manitoba, is found, in Section 51, as a condition of the permission to cut timber on the public lands, the obligation of the lessee to "prevent all unnecessary destruction of growing "timber, on the part of his men."

Vague as this is, it is a step in the right direction. I have not been able to find such a condition in any of the timber leases of the Provincial Governments, but I may have overlooked it; at all events, it is pretty certain that none of them goes further than that; and we must go further.

The growing timber must be protected, for upon it depends the future of our forests. Next to valueless now, it will increase in value in a wonderful short time, in diameter, girth and length, without any trouble or expense to any one; it is the best of all investments. Its protection calls for the strictest regulations, strictly enforced, and there ought to be severe penalties for the wanton destruction of growing trees by the lumbermen, even in their limits, as there are already, by law, for others than lumbermen. Of course this does not apply to cases of necessity, nor where it could not be helped, as in the felling of trees for lumber, when a large tree will crush down small ones, making and straightening of roads, &c., as long as carried on with care and prudence.

I would respectfully suggest the immediate consideration of the subject of protection to the growing trees, as every year so many of them are destroyed, and we require them now, more than we ever did.

MANUFACTURE OF EXTRACT OF HEMLOCK BARK FOR TANNING.

It is impossible, in a Report of this kind, to enter into a minute detail of all the causes which contribute to the exhaustion of our forests; I will only mention one more, because it threatens to have serious results, not only for the forests, but for one of our important industries, that of the tanning of skins, and would affect, as a natural consequence, the manufacture of shoes. It is the waste attending the procuring of hemlock bark for the manufacture of tanning extract.

A few lines taken from the Report of a Committee of the House of Commons in 1868, will help to explain the question: "The bark consumed in our local tanneries "is applied to a legitimate use that is beneficial, both to the settler and to the country

"at large; the settler is profited by the sale of that which would otherwise be valueless to him, while, at the same time, he may be able to utilize the timber in the erection of his farm buildings, and in localities situated in the neighborhood of mills, or having access to market, by river or rail—a large proportion of the timber may be manufactured and profitably disposed of, and the waste is thus reduced to a minimum. The clearing of the country in this way is followed by actual settlement in localities that otherwise would long remain a wilderness, and, therefore, tends to advance the material progress of the country."

The making of hemlock bark, carried on in accordance with these views, can only do good to the country; but the way in which the hemlock forests are destroyed, to supply material for the manufacturing of extract for exportation, calls for the strongest protest. It was estimated, in the said Report, that an extent of about ten thousand acres of the best hemlock land was stripped every year for the means of supplying with bark, the factories of tanning extract, the timber being left to rot on the ground.

That Report was made in 1868, when there were twenty-three thousand barrels of extract exported; in 1876 nearly twenty-nine thousand barrels were exported and forty-three thousand cords of bark, so that it will be seen that the production has not decreased since the date of the report, and the destruction must have been going on all this time. Five-sixths of the whole Dominion export is derived from the Eastern Townships of Quebec, and it is easy to fancy at what a cost of valuable timber; hemlock will become more and more useful as pine disappears, and we must do our best to arrest its wanton destruction.

The best way to protect it, would be to lay an export duty on hemlock bark and extract of that bark, as we have already on shingle bolts, stave bolts, oak, spruce and pine logs. It would, at the same time, protect hemlock on the private lands as well as on the public domain.

I would further suggest the adoption of the following condition (which is attached to the timber licenses of New Brunswick) in licenses granted in the other Provinces: "And on the further condition that the trunk as well as the bark of any hemlock trees, to be cut under pretence of this license, shall be removed and taken beyond the limits thereof, before the 1st of July next, otherwise the cutting of the said hemlock trees shall be prosecuted and dealt with as a trespass, in the same manner as if this license had never been granted."

THE PLANTING OF FOREST TREES.

It is not only in old countries, like England, France and Germany, that new forests are planted; it is in countries younger than Canada, in New Zealand and the Australian Colonies, for instance, where wood is not such an object of first necessity as with us, and where it is not so scarce as on our Western Prairies and, I am sorry to say, in some of our old Eastern settlements.

Now Zealand, the Australian Colonies, and India have taken active steps for planting new forests, and, at our doors, the United States Government are giving encouragement, by grants of land and otherwise to those who are willing to plant trees, while a number of Societies are working in the same direction. We have only, if I am not mistaken, one Society in the Dominion whose only purpose is to encourage the plantation of forest trees (I do not speak of orchards.) It is in the Province of Quebec, where the want of it is seriously felt; each member binds himself to plant a certain number of trees every year. Government will have to give some encouragement and go to the expense of making experiments on a larger scale, before any important results can be anticipated.

It is especially in our Western Prairies that the attempt could be profitably made, and with every chance of success. Professor Macoun (*vide* Mr. Fleming's Pacific Report) says, in speaking of the first Prairie Steppe, which comprises, in its limits, Manitoba: "From a careful study of its rainfall and its natural productions, I have no hesitation in saying that all our forest trees will be easily grown on any part of the first Prairie Steppe."

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nowhere, as compared with either oak or walnut or pine; men who have handled it all their lives have never thought of ascertaining what its rate of growth was; if they would only count the annual rings from the heart to the circumference, or even one or two inches long of them, they would be surprised to see what a slow grower white spruce is.

If our black walnut and oak do really grow faster than the pine and spruce (as I think they do, and it is very easy for any one who chooses to find out for himself), it is one point in their favor. A second point is that they are easier to grow from seed (nut and acorn) than pine, and that they bear transplanting better; the drying off of the top is not so fatal to hardwood trees as it is to conifers. Having sown a good many of each kind, I have often noticed that the oak and black walnut acquire strength and vigour sufficient to protect them against ordinary accidents much sooner than the young pine, which is much more brittle.

Then again, a forest of oak and walnut is not exposed to the same danger from fire as a pine forest is; I would refer to the chapter of fires by settlers, in the first part of this Report, for proofs of the correctness of this assertion.

As the timber of the black walnut and oak is much more valuable than the pine and spruce, as their growth is more rapid, and more secure, and as they are less exposed to the danger of fire, they appear to be entitled to preference over pine and spruce for planting wherever the soil is favourable to them, as it is in the western prairies, whose fertility is well known, and where, as Professor Macoun says, all our forest trees will be easily grown.

In dry, sandy soil, of course the conifers must have the preference.

There is a difficulty in bringing hardwood timber to market, as its weight prevents it from floating. The *London Timber Trade Journal* contains some hints on a process employed in some parts of India, for floating heavy timber, even *teak*; it is called *girdling*. A ring of bark is removed all around the tree. The tree dies very soon and begins to dry up more thoroughly than if it was lying on the ground. After a certain time, it appears that it becomes light enough to float, and then it is cut down. I have had several hardwood trees of different kinds *girdled* last winter, and will be able to ascertain, next spring, if their specific gravity has decreased sufficiently to allow them to float. It may impair the quality of the timber, especially for out-door usage, where it is more exposed to rot; that will have to be ascertained; but, if it does not injure it materially, it would be an advantage and render accessible a great quantity of hardwood, which is now left in the forest on account of the great expense of hauling it any distances by land.

Of all our Canadian trees, the quickest grower is the Canadian poplar (commonly called *tremble* and *aspen tree*.) It will, under favourable circumstances, grow about one inch in diameter every year. I planted myself, three cuttings of that tree nineteen years ago, one of them is now fifty-eight inches in circumference at the foot; the second fifty-seven inches, and the third fifty-three, with length in proportion.

Its timber has little value where there is pine, spruce and hemlock in abundance, but, on the continent of Europe, nearly all the packing boxes, cases, &c., &c., are made out of poplar, whose wood is very much like that of our Canadian poplar.

Such trees would be very useful in a denuded prairie, to start with; they would give shade at once, break the wind, shelter the young plantations of more valuable trees, not run the same danger of destruction by fire as conifers, and when better trees are ready to take their place, they could be cut down and their wood turned to good account.

SUGARIES OR MAPLE ORCHARDS.

Before closing this lengthy Report, I must beg leave to suggest what appears to me the easiest way of replacing our destroyed sugaries (or maple-orchards) and making new ones.

There are, on almost every farm, spots where trees might be planted with advantage, without interfering with farming operations. Maple recommends itself

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for the splendid quality of its wood, and especially for the profits yielded by it every year, in the shape of sugar. Farmers who are industrious enough to plant them, generally plant them too large, under an erroneous impression that they will, thereby, gain time. They are at a great deal of trouble and expense in selecting them and getting them out of the woods and planting them with extra precautions; large trees require strong staking to steady them against the winds, etc. Those trees, with their large roots broken, their rootlets torn, suddenly removed from the shelter, under which they were born and have always grown, are exposed to die in great numbers; the survivors linger for years before they can recuperate enough to go on with their growth; all this is rather discouraging.

A cheaper way to raise a maple orchard is this: In the fall, after a heavy rain, if you go to any maple grove, you will find that the maple seedlings, with which the ground is covered, as with a thick carpet, will pull up as easily as carrots with scarcely any damage to the little rootlets; in one hour you can collect hundreds of them, if the ground is sufficiently wet and soft.

Plant them at once, in a corner of your garden in good mellow ground, about two feet apart each way if you can dispose of that much room; you can put at that rate, nine thousand two hundred and sixteen seedlings in one superficial acre,—a fine nursery sufficient to supply trees for fifty seven acres of maple orchard; for the wants of a farmer a little corner of his garden will be sufficient. Weed two or three times during the summer with a light hoe, it will mellow the ground, at the same time, and as the little trees grow up, prune them into good shape.

In four years they will be fit for transplanting, about an average height of five feet, and the thickness of a man's thumb. Out of one hundred and fifty of those maple seedlings, treated as I have just described, I did not lose one from any other cause but the gnawing of the bark by field mice in winter, which killed about half a dozen, and that can be provided against by trampling the snow round the stems, when it is damp.

Of course, in those four years they have grown much more rapidly than if they had remained in the woods choking one another, but that forced growth does not appear to weaken them. There is no trouble nor loss in transplanting, their roots do not run under those of big trees as when you take them full grown, out of the woods; there are no stones nor stumps to interfere. You can lift them up tenderly, and with a good-sized ball as you dig a regular ditch in the soft ground parallel with the first row, and take them up from underneath, one by one, and row by row.

I think they will soon overtake and pass maples raised and planted ten or twelve feet high. I cannot, as yet, assert this as a fact, as my experiments are of too late a date; but there are strong grounds for expecting that it will be so, because they are accustomed to dispense with the shelter afforded by the large forest trees, and they are so little hurt by the safe way in which they have been transplanted, that their growth is very little checked, while the growth of a large tree is seriously checked by transplanting, if the operation is not carried on with more care and expense than our farmers can afford.

One might write volumes on this question of planting trees, but there is a better book than printed books, out of which we can learn,—I mean the great book of nature. No country is that book written in grander types than in North America; we want men who can read it, and teach us how to read it, and this leads me naturally to the conclusion of my Report, the study of forestry.

STUDY OF FORESTRY.

A requested by the Council, I have suggested a number of measures in this Report for the preservation of our forests, and have added some hints for the planting of new ones. But how can these measures, or any others that may be deemed preferable be carried out without the help of men brought up to the profession of forestry? Every question connected with our forests, we feel the want of a good staff of foresters, such as they have got in Europe, not trained specially in forestry.

schools and academies connected with the best managed forests in the world. In India they have now got such a staff of officers, and they send them to Europe to perfect themselves among the great foresters of Germany and France.

We can never expect to see our old forests properly managed, and new forests started on our prairies, and wherever their want is felt in other parts of the Dominion, without experienced foresters to take charge of the work. I think no money could be more profitably spent, and bring larger returns, than in establishing a Dominion School of Forestry.

In the meantime, until the good results of such an institution can make themselves felt, I would recommend that competent men should be procured from old established schools abroad, and that intelligent Canadians should be selected and sent to Europe, to study there the best systems of forestry, with a view to their application to our own country.

The whole respectfully submitted.

I have the honour to be, Sir,

Your obedient servant,

H. G. JOLY.

To the Honourable

The Minister of Agriculture,

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